

GCSE



Chief Examiner's Report
Further
Mathematics

Summer Series 2018



Foreword

This booklet outlines the performance of candidates in all aspects of CCEA's General Certificate of Secondary Education (GCSE) in Further Mathematics (Revised) for this series.

CCEA hopes that the Chief Examiner's and/or Principal Moderator's report(s) will be viewed as a helpful and constructive medium to further support teachers and the learning process.

This booklet forms part of the suite of support materials for the specification. Further materials are available from the specification's microsite on our website at www.ccea.org.uk.

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GCSE FURTHER MATHEMATICS

Chief Examiner's Report

Assessment Unit 1

Pure Mathematics

Candidates generally performed reasonably well on this paper. There were some high scoring papers, but also some very low scoring ones. As this was the first paper within the new specification, it was hard to judge the overall difficulty but the paper certainly provided for those at the upper end. Written responses indicated strengths in the majority of topic areas but there were a number of candidates who attempted few, if any, of the questions. Topics which were new to the syllabus were often not answered as well as might have been expected. The questions on the solution of three linear equations and the log-log graph were not answered as well as they used to be on the old Additional Maths syllabus. There is much teaching material in the old Additional Maths papers which could be used.

The paper allowed the more able candidates to display their ability while the less able were still able to show that they had basic mathematical skills. However, it was clear to see that perhaps some candidates were not ready for this paper. As these would have been year 11 pupils, they lacked the algebra skills that would come from having completed their GCSE Maths. Basic algebraic errors were evident and this undermined the potential for full solutions. Perhaps secondary schools taking this subject for the first time did not have access to the older Additional Maths papers.

Working was generally well developed with answers given to an appropriate degree of accuracy.

Questions 4, 8 (iii) and 11 were new to this specification but evidence suggested topics had been covered in sufficient detail.

The paper was of the correct length as there was no evidence to suggest that candidates were pushed for time.

Comments on Individual Questions

Q1 Differentiation. This question was well done, with the majority of candidates being able to differentiate correctly. The fraction and negative power were dealt with well by the majority of candidates.

Q2 Definite Integration. This was answered reasonably well, but in general, the standard of integration is not as good as that for differentiation with errors commonly evident in the second term. Candidates should simplify terms before substituting in numerical values. Some kept expressions such as $3x^3/3$ or $(-2x-1)/(-1)$ when substituting $x = 2$ and $x = 1$, and often this led to arithmetic slips.

Those who achieved full marks worked accurately but often included poor notation, including keeping the integral sign in after carrying out the process and not including brackets to separate substitutions.

Q3 Trigonometry. Part (a) (sine graph) was not answered as well as expected. Those who had the correct points on the curve often drew it with the sides too straight. Many lost marks on the lack of a curve, gaining the mark for points only. The points could easily be found using a calculator; however, some failed to achieve this.

Part (b) (trig equation) was answered fairly well. This was a standard question, usually asked in two parts. However, candidates were able to cope well. The most common incorrect answers were 60° and 300° for the first part, but these candidates could gain

follow through marks in the second part. Those candidates who followed the steps in solving any basic trigonometric equation were rewarded with full solutions. Many candidates experienced difficulties in using their CAST diagram and the inclusion on a negative value compounded these issues. Some candidates were able to establish correct values from CAST but their work was undone by poor algebraic manipulation in order to make x the subject of the formula.

Q4 Quadratic Inequality. This question was a bit disappointing. Too many candidates failed to deal with the 5 on the LHS and this led to a loss of all marks. Those who did deal with the 5 solved the correct equation to get the roots at -3 and 1.5. However the majority then had difficulty in giving the answer to the inequality. Specification is clear that all quadratics in this topic will be able to be factorised but many ended with decimal answers, mainly from solving LHS only = 0.

Many keep the inequality sign in their working and still do so incorrectly when critical values have been found. Those who established the correct critical values often followed it through to a correct range. However, incorrect inequality signs were often presented.

Q5 Matrices. Really well done with good FT marks for those who slipped up in the P-Q part. Many candidates made progress within the question and gained some marks, realising that the generation of an inverse was central to solving the question. Occasionally they multiplied the matrices in the wrong order. Errors here were usually the result of arithmetic slips.

Q6 Logs. This was a standard question and most candidates completed it successfully. Some candidates are still careless about not using brackets in expressions, eg writing $2x - 1 \log 3$. Some candidates used base 3 or base 7, which was fine, but they tend to make more mistakes than those who stick to base 10. Problems occurred with isolating x for the candidates who got this wrong. Those candidates who left calculator work until the last step were generally more successful.

Q7 Differential calculus. This question was a good discriminator. Most candidates knew to differentiate and to set the derivative to zero, but only the extremely able candidates could then manipulate the resulting equation to get the required cubic.

This was the first question where candidates had to problem solve and work out what the question was asking them to do. Many candidates did not score more than 3/6 with only a very small number achieving full marks.

Q8 Algebraic fractions and completing the square. Some candidates struggled with the factorizations and cancellations required, but many got the first two parts correct. However, more practice is required in this topic. The weak levels of algebra were most evident in this question with many candidates unsure of the best approach to solving the question. With plenty of past paper practice it should be evident that the first thing to do in these questions is to factorise all quadratics. Quite a number of candidates failed to do so, therefore tying themselves up in knots with cubic numerators and denominators. This then resulted in losing the next 2 marks. However, a mark was available on FT for cross multiplication. There was also evidence of incorrect cancelling, especially with the algebraic addition of the two fractions. In (ii), most candidates linked back to Part (i) but an incorrect answer to Part (i) limited any progress.

Completing the square was very well done as the equation to solve was given.

Q9 Differential calculus and curve sketching. In Part (i) it was disappointing to see a number of candidates differentiating and finding the x values of the coordinates of the turning points. Parts (ii) and (iii) were generally well done and those who completed the first three parts correctly almost always got the sketch correct. Quite a few candidates went straight in to differentiating and finding turning points in Part (i). However, overall this was a well answered question with quite a number of candidates getting full marks.

Candidates need to ensure the sketch extends to all relevant regions.

Q10 Simultaneous equations, 3 unknowns. This question was more challenging than other years as the second equation wasn't 'show that' in nature. Part (i) caused few problems, but many got Part (ii) wrong. This demonstrates the lack of experience in problem solving, especially in algebra, that these candidates would have. It was common to see $x + y - z = 55$ given. In Part (iii) quite a few candidates set out their answers very poorly. When asked to show an equation they need to show clearly each step of its derivation. In Part (iv), if they began with an incorrect equation, then the answers were clearly wrong. Some candidates didn't seem to realise that very large or negative values were meaningless. Candidates still seem unwilling to look at their final values and see if they make sense in the context of the question as a whole. Some candidates began with equations which were not independent, but through arithmetic slips ended up with answers which were clearly incorrect.

The skill in solving three simultaneous equations was there and candidates seemed clear on how to eliminate etc, but being unable to set up a simple equation was a let-down.

Q11 Log/log graph. Almost all candidates knew to take logs. Even less able candidates could get marks by taking logs and drawing the graph, provided they remembered to label their axes. However, in the graphs inappropriate scales were often used, resulting in the points on the line lying very close together. Candidates were usually able to find k as the gradient of the line, but a large number failed to get A, some giving $\log A$ as the answer. Also, there were too many areas of poor mathematical working, including some using the log values in the exponential equation. In the final parts most candidates were able to carry out the calculations, but if their values for k and A were not correct then the answers were usually not consistent with the given data. Only those who obtained these values correctly were able to make progress into Part (iii) and Part (iv).

Q12 Optimisation. Candidates found this demanding but more down to the fact that it was a bit different. In Part (i), most added but too many failed to expand to show. Only a few candidates made progress in Part (ii) although some marks were picked up again in Part (iii). In Part (i) most candidates knew to add the two terms, but didn't set out their answers very clearly. When asked to show an answer, candidates should clearly present all steps. Some candidates expanded each term separately and then just wrote the given answer without clearly showing that they needed to add the two terms. Candidates generally gave good answers to Part (iii), with quite a number of candidates gaining full marks (though some went on to calculate the total number of shoppers and gave this as their answer).

This was a very good question to complete the paper.

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